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ABSTRACT

This article focuses on an urban field-based teacher educatien program which emphasizes reading in three content areas: (1) reading/language arts; (2) science; and (3) social studies. Included in the report is a summary of the program including: (1) program goals; (2) objectives for each of the three content areas; (3) text books, periodicals, and children's readings used in the prcgram; and (4) hcw to select and evaluate science reading materials. (SA)

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SCIENCE AND THE RIGHT TO READ:

A TEACHER EDUCATION PROGRAM

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Since the early sixties, in an effort to increase the process aspect of science, many curriculum writers and teachers have emphasized self-discovery activities to the exclusion of reading in science. Prior to the new science curricula, science, unfortunately, was often little more than reading about science (1). Students read indifferently and passively to secure answers to questions posed by their teachers or text author. It is not unexpected that, as with many curricular trends, there was a tendency to swing from one extreme to another. Yet the statement by James Allen, former United States Commissioner of Education, affirming every child's right to read is difficult to challenge or dismiss (2). This right should include the right to read science and it is our responsibility as teachers to assist in assuring every child this right. In order to achieve the kind of scientific literacy we would like to see in our students we need to re-examine the procedures we use to help children learn science.

Children obviously cannot learn everything in science through hands-on experiences. Consequently, the development of scientific facts and concepts must rest, to a large extent, on the student's ability to read appropriate materials and to understand the printed word. Our challenge then becomes one of finding the proper balance of first-hand experiences and the use of reading materials to achieve the overall objectives of science teaching (3,4).

Hands-on science activities can be used to develop understandings and skills at a concrete and personal level. They can also be used to motivate children to want to know more about a topic. Often, however, the answers children seek are either not possible or feasible to discover through inves-

tigation. At this point, it becomes the responsibility of the teacher to nurture and facilitate this quest for knowledge by providing appropriate readings. This is not to say that reading should supplant direct experience but rather that reading should be viewed as an additional source of learning; one that becomes increasingly important in life. Reading is part of our daily lives and early successful experiences in reading can help develop appreciation of and skills in reading.

The difficulty for the classroom teacher is in providing successful experiences in reading. Herein lies the problem; for each content area there are specific skills that must be mastered so that reading within a content area will result in understanding and appreciation. Many children are not prepared for the greater demands of reading in the content areas. These demands include vocabulary and concepts specific to a content area, differing organizational patterns, and specialized symbols and illustrations unique to each content area.

The specialized skills needed for successful reading in the content areas require classroom teachers to be proficient in methods of teaching these skills. Since the teacher is the principal factor in the reading process, there exists the need for continuous examination of teacher education programs (5). Such examination must focus on the adequacy of pre- and in-service preparation for teaching beginning reading skills, critical reading skills, and the transfer of critical reading skills to content area material. Typically, in teacher education programs, methods for the development of these skills through basal programs have been the primary area of concern. Methods to aid children in transferring the skills necessary to critically

read content area material must also share the attention.

Observation of elementary and secondary school curricula reveal limited instruction being directed toward the development of reading skills needed by children as they encounter content area reading. The notion of the "crowded curriculum" pressures many teachers into feeling that it is more important to cover the content than to teach reading skills in the content areas. Such a dichotomy need not exist (6). The attitude that reading is an isolated subject unrelated to content area materials may be due to inadequate programs in teacher education. Unfortunately, while the majority of universities have espoused reading through content area teaching, few field-based programs exist that offer the teacher an integrated (theory and practice) model exemplifying implementation strategies needed to successfully read science, social studies, and other content materials. Although students in many universities may explore theoretically the topic of reading in the content-areas, few ever view or participate in the procedures necessary to implement such integrated teaching.

Today's teaching of reading too often remains an isolated activity apart from the content areas and is related solely to a basal program. A basal program is a beginning; it forms the foundation to later skill development. This foundation is essential, but it remains for all of us to acknowledge that for each content area there are special skills and approaches needed in addition to the development of common reading skills. In an attempt to provide an integrated reading through the content areas model, an urban field-based teacher education program stressing reading in the content areas was designed and implemented. The program was funded as an Exemplary Pre-Service

Teacher Training Program Development Project by the Right to Read Program of the United States Office of Education.

The program consisted of one full semester of instruction in the content areas (reading-language arts, science, and social studies) during the junior year block methods program. In order to provide an understanding of learners from an urban environment, the activities of the course were designed around urban, culturally diverse public and private school settings. The semester experience, involving junior interns, took place in six urban elementary schools. For 14 of the 16 semester weeks, content area instruction was provided in a school classroom since the university instructors defined field-based instruction as a program of study housed totally in a learning-setting other than the university.

Instruction in the content areas was interwoven with experience in the classroom three days a week. For example, on a typical Tuesday, the junior interns were involved in content course instruction from 8:00 - 9:30 A.M., and for the remainder of the school day, they worked in their assigned classrooms. During this time the interns were supervised by the university instructors as well as by their cooperating teacher. Similar patterns were followed on Wednesday and Thursday. The instructors included three professors, one each from the Departments of Reading and Language, Social Education, and Science and Mathematics Education.

Two areas of program goals were established: core objectives and content area objectives. Core objectives were divided into six major categories stressing an objectives-based approach to teaching. Instruction in 1). se-

lection and derivation of performance objectives were followed by 2). developing competencies in sequencing instruction, 3). application of classroom evaluation techniques, and 4). systematic planning and management of instruction. Basic to these skills was 5). the ability to interpret and apply cognitive theory and 6). the ability to identify and implement question-asking skills.

Content area objectives were organized for three content areas: (1) reading/language arts, (2) science, and (3) social studies. Each area included both the content and sequence of those elements considered fundamental to instruction in that content area. Furthermore, instructional concerns that are generic (Core Objectives) and relate to all content areas were applied to fulfill sequential needs in each particular area. The development of skills in all three content areas facilitated the development of instructional competencies that enabled the intern to integrate two or more content areas to provide interdisciplinary experiences for children.

The science education component of the block methods program sought to ally reading with a modern, activity approach to elementary science in which the nature of science was presented as the interrelationship of process and product. The teacher's responsibility was seen as one of arranging conditions such that children come to view science as a way of knowing. The way of knowing was treated as "ways" including self-discovery and the use of reading resources.

Formal instruction in both the basic and integrated science process skills was provided to aid the junior interns in developing a view of science

that included such process skills. The interns reviewed the major elementary science programs (ESS, SCIS, and S-APA), as well as other curricular materials, and participated in activities from each. In every case, children's reading sources related to the topic were presented and used. For example, on the topic of "Mystery Powders", the use of associated tradebooks such as Cup and Saucer Chemistry and the Wonder Book of Chemistry were discussed. The approach of using hands-on experiences to stimulate curiosity was heavily stressed and was followed by procedures for systematically channeling interest in further investigation through both additional activity and science reading sources.

Although emphasis was placed on children's tradebooks in science, the use of textbook series and children's periodicals (e.g. Ranger Rick) was also included. Sources of children's readings in science were investigated (AAAS Science Books, Science and Children, Subject Guide to Children's Books in Print).

The topic of selecting and evaluating science reading materials was tied closely to instruction on readability. Numerous techniques were reviewed from "eyeballing it" to readability formulas. The formula devised by Fry (7) was applied to representative readings in science for children. This particular formula was used because of its predictive accuracy and uncommon simplicity. The factors contributing to difficulties in reading science materials were discussed in depth. They included vocabulary, sentence length, style, organization, formulas, symbols, and graphic aids. The problem of vocabulary was treated by classifying words as technical, special, and general. Techniques for developing vocabulary skills were studied (recognizing

affixes, compound-words, and roots). Particular attention, however, was given to special and general vocabulary as there is considerable evidence (8) that children have greater difficulty with non-technical vocabulary in science writings than they do with the technical. Unaware of this, teachers ordinarily concentrate on new scientific terms to the exclusion of the other vocabulary (9). Methods were also presented for developing children's skills in: varying the rate of reading according to the purpose for reading; using parts of a book; locating sources of information; and analyzing paragraphs for main ideas and supporting evidence.

Assignments requiring the application of reading in the content areas teaching skills included a curriculum guide content/skills analysis, an annotated tradebook bibliography, and the creation and implementation of hands-on science activity/reading skill lesson plans.

The approach to the integration of reading into the content areas was developed through the mutual cooperation of the university faculty involved. This cooperation has built a program dedicated to preparing classroom teachers who are proficient in developing reading skills in the context of content areas. In an effort to further insure this proficiency, a supplementary independent learning module, "Reading in the Content Areas", was designed by the project staff.

This module was based on the concept that classroom teachers are reading teachers, but in order to be effective as such, they need to understand the reading process as it relates to content area studies. The module was an attempt to develop in pre-service teachers some of the necessary analytical

competencies and, in addition, to provide contexts for the application of these reading skills in the content areas.

Nine goals formed the framework for the module. The first three goals were concerned with: 1) the concept of student independence in the learning process through the use of reading in the content areas; 2) the major skills in the reading process needed for content area mastery; and 3) the methods of differentiating reading instruction to benefit individual needs. Goal 4 was concerned with the various teaching tools (e.g., workbooks, kits, activity cards), that can help the teacher implement reading instruction in the content areas. The remaining five goals were concerned with specific reading skills and activities used to promote reading in: 5) social studies; 6) sciences; 7) mathematics; 8) literature; and 9) music and art.

For each goal of the module, a list of readings from books, journals, and microfiche-microfilm documents was included. The interns were also encouraged to examine ERIC abstracts for other references that might be pertinent to their understanding of reading in the content areas. The variety of reading materials was intended to enable the students to effectively complete the post-assessments for each goal that were designed to reflect the students' understanding and mastery of specific performance objectives. Application of teaching skills in reading in the content areas was provided for through post-assessments requiring the integration of these skills in planned content area lessons.

Specific performance objectives and post-assessment tasks for each of the nine goals were provided. The objectives for reading in the sciences,

for example, required the interns to demonstrate their ability to identify technical, special, and general vocabulary words and to develop effective questions based on literal, inferential, and critical interpretation of selected science readings.

Science and the Right to Read effort can be effectively joined. The natural curiosity of children's developing minds can be enhanced through self-discovery science activities and, at the same time, the world of books can provide these youngsters with answers they may not be able to discover for themselves. The very absence of reading material in the structure of modern science programs places great responsibilities on both students and teachers. Students seeking additional information must read actively and proficiently from a variety of sources (10) and their teachers must be skillful in providing instruction that will develop this proficiency.

Science activities can provide a purpose for reading. While these activities are in progress, reading can be used to find answers and solve problems. Reading can also verify, supplement, and extend what has been learned during discovery activities. When reading has a purpose, interest is easily aroused and enthusiasm kindled. Such an integration of science and reading instruction may well contribute to the realization of each child's "right to read".

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